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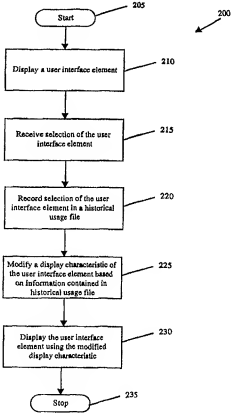
(54) Title: METHOD FOR ADAPTING USER INTERFACE ELEMENTS BASED ON HISTORICAL USAGE

(57) Abstract

Adapting user interface elements based on historical usage. A user interface element is displayed in a menu. In response to receiving an indication of the selection of the user interface element, the selection is stored in a historical usage file that maintains usage information associated with the selected user interface element. Usage information includes, but is not limited to, frequency, most recently used and recency information. The display characteristic of the user interface element can be modified based on the usage information stored in the historical usage file for the selected user interface element. The display characteristics include, but are not limited to, character size, font type, style, graphic. The selected user interface element is then displayed using the modified display characteristic.



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Method for Adapting User Interface Elements based on Historical Usage

Field of the Invention

The present invention generally relates to computer program user interfaces and more particularly relates to modifying user interface elements contained in user interfaces based on historical usage information.

Background

Graphical user interface (GUI) systems present information to the user in a graphical format using windows, toolbar displays, icons, graphics and hyperlinks. One of the goals of GUI systems is to present information needed by the

user in a pleasant and apparent manner expected by the user so that the user is more inclined to utilize the functions of the underlying software without having to memorize many commands. For example, to move the location of a file using a GUI, a user may only have to select a file and then drag it to the desired folder or other location. The user is not required to remember any text commands but is performing an activity, e.g., moving a file, by performing a natural or familiar function, e.g., selecting the file and moving it to the preferred destination.

As software becomes more complex and provides more functionality, the design of a GUI becomes increasingly more difficult. This results, typically, in more commands required to be presented to the user in order for that user take advantage of the additional functionality. In general, the goal of designing a GUI is to present commands to the user that are useful without being confusing. When the number of commands to be presented to the user increases, it becomes more difficult to present commands in a manner that presents the most desired commands to the user without requiring much searching. In addition, to perform a repetitive function, users are often required to enter the same information, related to performing the function, several times

Software designers have addressed this problem by creating user interface elements, such as menus, toolbars and hyperlinks, which can comprise multiple commands and increase the readability of the user interface. Menus present

commands in a pull-down fashion allowing multiple command access from a single point on the display. Toolbar displays contain controls, which are typically displayed constantly on a screen for easy access. Hyperlinks, when selected, execute commands to access a web page having the address programmed into the hyperlink.

However, even using the above described techniques, the user may still be required to search for a command that is often used or to enter the same significant amount of information every time a function is repeatedly invoked. For example, a user may add page numbers to every document in a word processing program. If the "page number" function is contained in a menu, the user must open the menu and search the list of menu items to find the "page number" function listed along with other commands not utilized as often. This additional search time results in the user spending more time interacting with program to find and invoke commands and less time utilizing the program for the desired task. To reduce the search time associated with user interface elements, it is advantageous to signify to the user which user interface elements are most desirable to that user.

Some programs allow a user to customize some aspects of the user interface, such as menus. These customization features, however, require the user to execute a tool or module to modify the user interface elements. In addition, the customization features do not change dynamically. If the user's requirements change, then the user

is forced to re-execute the tool and again change the user interface. One approach that dynamically changes the user interface is the Most Recently Used (MRU) list of files in the File menu or fonts in a Font menu of some applications. However, this MRU list suffers from being a fixed size and, when an item drops off the MRU list, any history of the item's usage is lost. In addition, one disparate action can destroy the recorded history of an MRU list.

Another prior approach includes changing the color of a hyperlink once it has been selected. However, while this solution also modifies the user interface element based on usage, it only records binary information (i.e., whether the link has been selected or not). It does not provide any additional information such as when it was selected, how it was selected or how often it is selected.

Therefore, there is a need in the art for a method that dynamically modifies user interface elements in response to usage patterns. This method should allow a user to quickly find a desired user interface element and simplify the number of repetitive steps entered by the user to perform a given task.

Summary of the Invention

The present invention satisfies the above-described needs by providing a method to dynamically modify user interface elements in response to usage patterns. The present invention also allows a user to effectively locate a desired user interface element of a user interface and can simplify the number of repetitive user interface operations completed by the user to perform a given task.

The present invention can perform the above described need by using a two-fold process. First, the usage of user interface elements are monitored and stored. The usage parameters tracked may include, but are not limited to, frequency, most frequently used (MRU) information, and recency information or a combination thereof. Frequency information comprises an aggregate count representing the number of times that a user interface element has been selected by a user. MRU information comprises a list indicating those user interface elements most recently used. A recency field may indicate, from a set of user interface elements, which user interface element was the most recently selected, the next most recently selected and continue in this fashion to the least most recently selected.

Second, the usage information gained from the monitoring operation is utilized to modify the user interface. This modification includes changing display characteristics of the user interface elements, such as character size, style, color or graphical representation as well as creating new user

interface elements to simplify the steps required to perform a specific task. However, display characteristics may include any change to the user interface element or those elements within a given region that affect the look of the user interface.

These aspects of the present invention include: Ransom Notes Menus, MyBars and Dynamic Web Pages. The Ransom Notes Menus and Dynamic Web Pages aspects can modify the user interface by changing a characteristic of the user interface elements associated with a particular region based on usage. The MyBars aspects can record the information entered by a user within a dialog box and creates a new user interface element associated with the user interface element that was initially used to bring up the dialog box. By doing this, MyBars reduces the number of steps required to perform the same operation a multiple number of times. All of the embodiments modify the user interface dynamically according to usage patterns. Usage patterns may include MRU, recency and frequency information. It may also include usage outside of the realm of the individual user running the application.

For the Ransom Notes Menus aspect, the frequency in which user interface elements are selected, within a single menu, is tracked. Frequency groups are then established. To generate the frequency groups, an average frequency of all the user interface elements is calculated. The user interface elements that are +/- 5% of the average frequency are assigned to a frequency group and assigned a

standard character size. For user interface elements below the average-5% mark, their frequencies are divided in half. The upper half is assigned to a frequency group and assigned a smaller character size than the standard size, and the lower half is assigned to a frequency group and assigned a smaller character size than the upper half. For those user interface elements having a frequency above the average+5% mark, frequency groups are assigned based on predefined deviations off the average and each group is assigned a different character sized up to a predefined maximum character size. The frequency values may be normalized when a specified maximum is reached. Although a frequency parameter and a character size display characteristic are typically used to adopt the presentation of the user interface based on usage of user interface elements, any usage parameter (e.g., MRUs, combining MRUs and frequency) may be used along with various display characteristics (e.g., color, style (bold, italics, underline, etc.) and graphical representation).

For the Dynamic Web Pages aspect, a methodology similar to that used with Ransom Notes Menus is adopted to operate hyperlinks. The usage of a hyperlink can be tracked and then stored in the user's browser history file. In the case where a character size is selected as the display characteristic to be modified, the character size of the hyperlink on the web page is determined based on selection frequency of the hyperlink.

In the MyBars aspect, a new user interface element can be created as a short cut to the information entered by a user in a dialog box during a previous operation. First, a user selects a user interface element that invokes a dialog box. The user then selects various parameters within that dialog box. This records parameters values entered in the dialog box, including any parameter values contained within nested dialog boxes. In other words, this operation can record all the parameters, selected by a user, accessed by the initial dialog box. Following the execution of a command using parameter values from the dialog box, a new user interface element can be created in a cascaded menu. The cascaded menu is then accessed via the same user interface element that initially executed the dialog box. A maximum number of user interface elements to be included in the cascaded menu may be assigned.

One advantage presented by the above mentioned invention aspects is that the user "create" the best user interface for that user without explicitly having to define the significance of specific user interface elements or characteristics thereof. Another advantage recognized is that the user interface is continuously updated based on usage so that the user interface reflects the user's most recent needs. And yet another advantage of the above embodiments is that user efficiency is increased by decreasing the search time required to identify desired user interface elements and the time required to perform tasks involving repetitive steps.

These and other advantages of the present invention may be more clearly understood and appreciated from a review of the following detailed description of the disclosed embodiments and by reference to the appended drawings and claims.

Brief Description of the Drawings

Fig. 1 is a block diagram of a personal computer illustrating the operating environment of an embodiment of the invention.

Fig. 2 is a flowchart illustrating the steps for modifying a user interface element based on historical usage in an exemplary embodiment of the invention.

Fig. 3 is a flowchart illustrating steps for modifying the display characteristic of a user interface element based on historical usage in an exemplary embodiment of the invention.

Fig. 4 is a flowchart illustrating the steps for modifying a user interface element in a menu based on historical usage in an exemplary embodiment of the invention.

Fig. 5 is a graphic depicting a user selecting a user interface element from a menu in an exemplary embodiment of the invention.

Fig. 6 is a graphic depicting the effect of a user's selection of a user interface element in a menu in an exemplary embodiment of the invention.

Fig. 7 is a graphic depicting a user selecting a hyperlink contained in a web page in an exemplary embodiment of the invention.

Fig. 8 is a graphic depicting the effect of a user's selection of a hyperlink in a web page in an exemplary embodiment of the invention.

Fig. 9 is a flowchart illustrating steps for creating a user interface element based on historical usage in an exemplary embodiment of the invention.

Figs. 10a-b, collectively described as Fig. 10, are graphics depicting a cascaded menu created by the user's selection of a user interface element in an exemplary embodiment of the invention.

Detailed Description

The present invention is directed toward methods for dynamically modifying user interface elements in response to usage patterns. In one embodiment, the invention is incorporated into a suite of applications bundled together and entitled "OFFICE 2000", marketed by Microsoft Corporation of Redmond, Washington. Briefly described, the "OFFICE 2000" application suite allows a user to access multiple applications while providing a consistent user interface between the bundled applications.

To modify a user interface element in response to usage patterns, the present invention receives a selection of the user interface element. The selection is recorded in a

historical usage file. The historical usage file contains a user interface element identifier and fields storing usage information related to the user interface element. This historical usage file may contain selection frequency, MRU and recency information. It is capable of storing multiple selection information for a user interface element.

The display characteristic of the user interface element is then modified based on the information contained in the historical usage file. The modification may use the frequency, MRU values, or the recency information stored in the usage file or any combination thereof.

In addition, the display characteristic that is modified may be any visual aspect of the user interface element. This includes, but is not limited to, font type, size, and style, as well as a modification to graphics related to the user interface element or color.

Following the modification of the display characteristic, the user interface element is then displayed using the modified characteristic.

In one embodiment, the modification to the display characteristic is based on selection frequency of the user interface element. An average selection frequency value is determined by summing all frequency selections of related user interface elements and dividing by the number of user interface elements.

Next, frequency groups are defined. Frequency groups are categories whereby all the related user interface

elements contained in a group will have been selected a similar number of times. The broader the frequency group is defined (i.e., the greater range of frequencies defined to a group), the higher the standard deviation of selections associated with user interface elements of the frequency group. The user interface elements are then assigned to a frequency group.

The display characteristic is then defined for each frequency group. In the case where character size is the display characteristic used, each frequency group will be assigned in using a distinct character size.

Exemplary Operating Environment

Fig. 1 and the following discussion are intended to provide a brief, general description of a suitable computing environment in which the invention may be implemented. While the invention will be described in the general context of an application program that runs on an operating system in conjunction with a personal computer, those skilled in the art will recognize that the invention also may be implemented in combination with other program modules. Generally, program modules include routines, programs, components, data structures, etc. that perform particular tasks or implement particular abstract data types. Moreover, those skilled in the art will appreciate that the invention may be practiced with other computer system configurations, including hand-held devices, multiprocessor systems, microprocessor-based or programmable consumer electronics, minicomputers,

mainframe computers, and the like. The invention may also be practiced in distributed computing environments where tasks are performed by remote processing devices that are linked through a communications network. In a distributed computing environment, program modules may be located in both local and remote memory storage devices.

With reference to Fig. 1, an exemplary system for implementing the invention includes a conventional personal computer 20, including a processing unit 21, a system memory 22, and a system bus 23 that couples the system memory to the processing unit 21. The system memory 22 includes read only memory (ROM) 24 and random access memory (RAM) 25. A basic input/output system 26 (BIOS), containing the basic routines that help to transfer information between elements within the personal computer 20, such as during start-up, is stored in ROM 24. The personal computer 20 further includes a hard disk drive 27, a magnetic disk drive 28, e.g., to read from or write to a removable disk 29, and an optical disk drive 30, e.g., for reading a CD-ROM disk 31 or to read from or write to other optical media. The hard disk drive 27, magnetic disk drive 28, and optical disk drive 30 are connected to the system bus 23 by a hard disk drive interface 32, a magnetic disk drive interface 33, and an optical drive interface 34, respectively. The drives and their associated computer-readable media provide nonvolatile storage for the personal computer 20. Although the description of computer-readable media above refers to a hard disk, a removable magnetic disk

and a CD-ROM disk, it should be appreciated by those skilled in the art that other types of media which are readable by a computer, such as magnetic cassettes, flash memory cards, digital video disks, Bernoulli cartridges, and the like, may also be used in the exemplary operating environment.

A number of program modules may be stored in the drives and RAM 25, including an operating system 35, one or more application programs 36, a user interface module 37, and program data 38. A user may enter commands and information into the personal computer 20 through a keyboard 40 and pointing device, such as a mouse 42. Other input devices (not shown) may include a microphone, joystick, game pad, satellite dish, scanner, or the like. These and other input devices are often connected to the processing unit 21 through a serial port interface 46 that is coupled to the system bus, but may be connected by other interfaces, such as a game port or a universal serial bus (USB). A monitor 47 or other type of display device is also connected to the system bus 23 via an interface, such as a video adapter 48. In addition to the monitor, personal computers typically include other peripheral output devices (not shown), such as speakers or printers.

The personal computer 20 may operate in a networked environment using logical connections to one or more remote computers, such as a remote computer 49. The remote computer 49 may be a server, a router, a peer device or other common network node, and typically includes many or all of the elements described relative to the personal

computer 20, although only a memory storage device 50 has been illustrated in Figure 1. The logical connections depicted in Figure 1 include a local area network (LAN) 51 and a wide area network (WAN) 52. Such networking environments are commonplace in offices, enterprise-wide computer networks, intranets and the Internet.

When used in a LAN networking environment, the personal computer 20 is connected to the LAN 51 through a network interface 53. When used in a WAN networking environment, the personal computer 20 typically includes a modem 54 or other means for establishing communications over the WAN 52, such as the Internet. The modem 54, which may be internal or external, is connected to the system bus 23 via the serial port interface 46. In a networked environment, program modules depicted relative to the personal computer 20, or portions thereof, may be stored in the remote memory storage device. It will be appreciated that the network connections shown are exemplary and other means of establishing a communications link between the computers may be used.

METHOD FOR MODIFYING A USER INTERFACE ELEMENT BASED ON HISTORICAL USAGE

Fig. 2 is a flow chart illustrating the steps for modifying the presentation of a user interface element based on historical usage in an exemplary embodiment of the invention. Method 200 begins at the start step 205, wherein an application program 36 has been executed and has invoked the user interface module 37. The user interface module 37 may incorporate several elements in the display, such as menus, menu items, tool bars, and hyperlinks. A user interface element is defined as that element in the user interface which is capable of being isolated and which represents a command or function when selected.

Proceeding to step 210, the user interface module 37 proceeds to display a user interface element. In the context of a GUI, a user interface element is selectable by the user by placing a cursor over the user interface element in the GUI and depressing a mouse button. It will be recognized by one skilled in the art that there are many ways in which a user interface element can be selected, including by keyboard entry. These multiple input methods are considered within the scope of the present invention.

At step 215, the selection of the user interface element is received. Each user interface element has a command, or multiple commands, associated with it. Typically, upon the selection of the user interface element, the

application program 36 will perform some command either through interfacing with the operating system 35 or with the program data 38. While execution of the commands associated with the user interface element is typically performed after selection, it is not required.

Proceeding to step 220, the selection of the user interface element is then recorded in a historical usage file. The historical usage file is preferably implemented as a database contained within the program data 38 or as a historical file associated with hyperlinks. However, it will be recognized by one skilled in the art that there are many storage techniques available to implement the present invention. The multiple storage techniques are considered within the scope of the present invention.

When using a database to store the historical usage information, it is preferable that each user interface element have an identification associated with it and a field indicating the frequency at which the user interface element has been selected. Therefore, in the preferred environment, when the selection is received at step 215, the identification of the user interface element is searched in a database, and, having retrieved the record matching the identification, the field indicating the frequency is incremented. It will be recognized by those skilled in the art that many fields may be associated with the user interface element. For example, a MRU field may be included.

Proceeding to step 225, a display characteristic of the user interface element based on the information obtained in the historical usage file is then modified. There are many display characteristics associated with the user interface elements. Examples of display characteristics include font type, character size, the style of the font (e.g., bold, underline) and a graphic. A graphic may include an icon or other associated graphic connected with the user interface element. It will be recognized by one skilled in the art that many display characteristics exist and that the preceding list is not exhaustive.

As stated, the information contained in the historical usage file related to a user interface element may be either a frequency value indicating how often the user interface element is selected, a MRU value, or any combination thereof. It will be recognized by those skilled in the art that these fields may require normalization to prevent the possibility of creating an overflow value in the field. After the display characteristic of the user interface element is modified, the processing continues to step 230, where the user interface element is displayed using the modified display characteristic.

It should be noted that in this embodiment, no user interface element is either hidden or shown based on the information contained in the historical usage file. Rather, this embodiment depicts how the user interface element is displayed and the usage fields that affect the display characteristics. In addition, another embodiment of the

present invention addresses modifying the display characteristics of other user interface elements related to the selected user interface element just displayed. Following step 230, processing terminates at step 235.

Fig. 3 is a flow chart illustrating the steps for modifying the display characteristic of a user interface element based on historical usage in an exemplary embodiment of the invention.

Method 300 begins at the start step 305, wherein a selection of a user interface element has already been made. In addition, this selection has already been recorded in the historical usage file. Method 300 will use the information stored in the historical usage file to define a display characteristic for the selected user interface element.

Proceeding to step 310, the average selection frequency value is determined by summing the frequency selections of related user interface elements and dividing by the number of related user interface elements. An average is used in order to provide an anchor value for defining the range of display characteristics that will be assigned to the user interface elements. It is preferable to use the frequency selections of related user interfaces because it is desirable to distinguish display characteristics between related user interface elements, not necessarily to distinguish between all user interface elements contained in the user interface. For example, it is preferable to distinguish which user interface elements are most frequently used in a menu for comparison.

However, it may not be desirable to have the comparison made across all menus, toolbars and hyperlinks.

Proceeding to step 315, frequency groups are defined and user interface elements are assigned to a frequency group. A frequency group is a category of that contains a range of values. User interface elements are assigned to a category if their frequency parameter falls within the frequency group's range. Assigning the user interface element to a frequency group allows user interface elements, which have been selected a similar number of times, to be categorized similarly.

Proceeding to step 320, the display characteristic is defined for use with each frequency group. The display characteristic are those characteristics that affect the display of the user interface element. In step 320, because the display characteristic is defined for a frequency group, it is preferable that each user interface element contained within that frequency group be displayed using the same display characteristic. For example, if the display characteristic is character size, the user interface elements contained in the same frequency group will be displayed using the same character size as defined in step 315. The result is that the user sees those user interface elements that have been selected roughly a similar number of times with the same character size. In addition, those user interface elements belonging to another frequency group indicating that they have been selected more often may be defined to have a display

characteristic of a larger font. This results in the user seeing the user interface elements, that have been selected more often, more prominently displayed.

It will be recognized by one skilled in the art that while this example discusses character size, that any of the display characteristics or combinations of display characteristics may be used with this embodiment. This process then terminates at step 325.

METHOD TO MODIFY USER INTERFACE ELEMENT IN A MENU (RANSOM NOTES MENUS)

Fig. 4 is a flow chart illustrating the steps for modifying a user interface element in a menu based on historical usage in an exemplary embodiment of the present invention. This process begins at step 405 where an application has been executed on a computer system, and the application has called the user interface module to display various user interface elements including a menu bar. A menu bar is a list of user interface elements that when selected will display a menu containing additional user interface elements. Each of the user interface elements in the menu may perform a specific function.

Proceeding to step 410, a selection of a user interface element from the menu is received. As stated, this selection can be completed by isolating the user interface element using any input paradigm, such as a cursor and mouse

buttons or through a keyboard entry, desired by one implementing this embodiment.

Proceeding to step 415, the selection of the user interface element is stored in the historical usage file. The historical usage file contains information related to the selection of the user interface element. There are many usage fields that may stored in the historical usage file pertaining to a user interface element. In one embodiment, the values contained in the usage fields are relative to related user interface elements, i.e., the MRU values relative to those user interface elements contained in the same menu or all menus in the user interface.

Proceeding to step 420, a selection frequency value for each user interface element in the menu is determined. This may be performed first by incrementing a frequency field associated with each user interface element, whenever that user interface element is selected. The selection frequency for each user interface element is then determined by retrieving the corresponding frequency field.

It is preferable in modifying user interface element display characteristics that the frequency value be used versus a MRU value. MRU lists are lists that present a set of items based on the order that they are used. Typically, MRU lists have a fixed size. It is preferable to use a frequency value because the moment a user interface element is dropped off the MRU list, the benefit of any information that has been stored, and was the basis for the MRU list, is lost. In addition, one

disparate action can destroy the recorded history. For example, if a user selects a user interface element that is not often used but is required for a specific task, then this user interface element may be displayed more prominently in the MRU list than its actual value to the user suggests. This prominence is unwarranted merely because the user was required to perform the task at one time.

Proceeding to step 425, a character size is assigned to each user interface element based on its selection frequency value. In one embodiment, this may be performed by defining frequency groups and placing each of the user interface elements in a frequency group and assigning a display characteristic for each frequency group. This is preferable, particularly when there are a limited number of display characteristics that are desired to be shown to the user. For example, as related to character size, it is preferable that the size not be displayed less than 8 point for readability and not larger than 20 to 22 point for practicality reasons (i.e., there needs to be space to display all of the user interface elements within the menu). Therefore, placing the user interface elements in frequency groups simplifies the process of determining a range of display characteristics along a finite set of user interface elements having a variable usage parameter value (e.g., frequency).

In this embodiment, it is preferable that those user interface elements that have been selected more often, or in a frequency group representing a higher number of selections,

be assigned a larger character size than those having been selected fewer times or in a frequency group representing a fewer number of selections.

By representing the character size in this manner, those user interface elements are displayed more prominently because the user has selected them more often. Because the user has selected these user interface elements more often in the past, it is reasonable to expect that a user also would desire to select those user elements more often in the future. The process then terminates at step 430.

Fig. 5 is a graphic depicting a selection of a user interface element in a menu in an exemplary embodiment of the invention. Fig. 5 depicts the "Insert" user interface item 500 being selected, thereby causing a menu 505 to be displayed containing additional user interface items, such as the "File" user interface item 520 and the "Picture" user interface item 525. The user interface items are displayed in varying character sizes. For example, the "Picture" user interface element 525 is displayed using a larger character size than the "File" user interface element 520. This embodiment displays these user interface elements in a character size based on the frequency of which the user interface elements were selected. Therefore, visual inspection of the menu 505 indicates that the "Picture" user interface element 525 has been selected more often than the "File" user interface element 520.

It will be recognized by one skilled in the art that while this embodiment depicts modified display characteristics

using sizes, that any display characteristic may be used to signify a change based on usage. In addition, it will be recognized by one skilled in the art that there are many usage parameters that may be collected and analyzed in order to change the display characteristic. While the display characteristics and usage parameters may vary based on the implementation, these varying implementation choices are considered within the scope of the present invention.

The menu 505 has been displayed in response to the user selecting the "Insert" user interface element 500. In this embodiment, the user desires to use the "Bookmark" user interface element 510. The user can select the "Bookmark" user interface element 510 by moving the arrow 515 to the bookmark user interface element and selecting it using a mouse input (or a keyboard entry).

After the user selects the "Bookmark" user interface element 510, this selection is stored into a database and the frequency selection field associated with the "Bookmark" user interface element 510 is incremented. Following the selection, this embodiment then initiates a command to perform the function associated with the "Bookmark" user interface element 510.

Fig. 6 is a graphic depicting the effect of the user selection of the "Bookmark" user interface element in a menu in an exemplary embodiment of the present invention. In this embodiment, following the selection of the "Bookmark" user interface element 510 from Fig. 5, the menu 505 then

disappears (not shown). Fig. 6 depicts the user selecting the "Insert" user interface element 500, typically by using an input device such as a mouse or keyboard, to move the arrow proximate to the "Insert" element, 515 after the user has selected the "Bookmark" user interface element 510 from Fig. 5. The result of the selection of the "Insert" user interface element 500 is again displaying a menu 505 containing user interface elements associated with the "Insert" user interface element 500.

When the menu 505 is displayed, the display characteristic of character size associated with the "Bookmark" user interface element 510, as shown selected in Fig. 5, is modified. Because this embodiment modifies the character size display characteristic based on frequency, the "Bookmark" user interface element 510 in Fig. 6 is modified to be displayed using a larger character size. This indicates that this user interface element has been used more frequently than a user interface element within the menu 505 having a smaller character size. For example, in Fig. 5, the "Bookmark" user interface element 510 was the same character size as the "File" user interface element 520. After the selection of the "Bookmark" user interface element 510 (Fig. 5) and the modification of the character size, the "Bookmark" user interface element 510 in Fig. 6 is displayed using a larger character size than the "File" user interface element 520.

For readability, it is preferred that the character sizes associated with the user interface elements are not

reduced below an 8 point size. For practicality concerns, it is preferable that the user interface elements do not grow to be larger than the 22 point size. However, this may change depending on the size of the menu, the number of user interface elements within the menu, as well as monitor characteristics such as resolution and monitor size.

It will be recognized by one skilled in the art that while although this example depicts a user interface element and menu user interface elements, where the display characteristics are modified based on frequency usage, the present invention also applies to any user interface element contained within the user interface environment. Therefore, this method would also apply to controls within the toolbar or icons displayed on the screen. The display characteristic of a user interface element in a menu can also be any aspect that affects the display of the user interface element. These aspects can include font type, style, character size, color or a graphic associated with a particular user interface element. In addition, the display characteristic may include changes to the user interface environment based on the historical usage information. For example, when positioning a cursor over a user interface element, those user interface elements having a higher frequency can be programmed to attract the cursor towards their position in a stronger manner than those having a lower frequency. Therefore, as the cursor approaches the user interface elements, the one having the higher frequency, in this example, would actually draw the cursor closer towards

it. This makes it easier for the user to chose the user interface element having a higher frequency and more difficult to chose a user interface element having a lower frequency.

METHOD FOR MODIFYING HYPERLINKS BASED ON USAGE (DYNAMIC WEB PAGES)

Fig. 7 is a graphic depicting selection of a hyperlink contained in a web page in an exemplary embodiment of the invention. A hyperlink is a portion of a web page generally associated with text or a graphic that, upon selecting that portion, invokes a command to enter the address of the URL and to retrieve the information from the web page contained at the URL address.

Hyperlinks are used often in the World Wide Web environment where a browser is used to retrieve information through the Internet at various web sites. An example of a web page is provided in Fig. 7. The web page 700 is displayed using the Microsoft "INTERNET EXPLORER" browser application program developed by Microsoft Corporation, Redmond Washington. The web page 700 contains several items of information. These include a menu 720, a toolbar containing controls 725, text 730, as well as hyperlinks 705 and 710. The user selects the hyperlink, typically, by using a mouse pointer 715 placing it over the hyperlink and pressing a mouse button. Upon release of the mouse button, the commands associated with the hyperlink are then executed. It will be appreciated that a keyboard also can be used for selection of the hyperlink.

In one embodiment of the present invention, the selection is also recorded in a historical usage file associated with the selected hyperlink. Note that the hyperlinks 705 and 710 contain characters that are of roughly equivalent sizes.

Fig. 8 is a graphic depicting the effect of the selection of a hyperlink in a web page in an exemplary embodiment of the invention. Generally, when a hyperlink is executed, the information contained at the URL associated with the hyperlink is displayed in a window. This window may be the same window which contains the selected hyperlink or may be another window that is invoked and displayed in addition to the window containing the hyperlink. When the user returns back from the web page containing the selected hyperlink 710, the web page 700 from Fig. 8 is again displayed. The effect of the selection is displayed in the web page 700 in Fig. 8 with respect to hyperlink 710. In this embodiment, frequency usage is the basis for modifying the display characteristic of the user interface element. For this example, character size is the display characteristic that is modified. Therefore, the character size in Fig. 8 of the hyperlink 710 has been modified to be larger than the character size of the hyperlink 710 in Fig. 7. This indicates to the user viewing the web page 700 that the hyperlink 710 has been selected more often than the hyperlink 705. The user determines this quickly at a glance by seeing the larger character size associated with the hyperlink 710.

As the user continues to utilize this page and select user interface elements, the display size of these user interface

elements can change correspondingly. For example, if the user continues to select hyperlink 710 more often than hyperlink 705, the hyperlink 710 can continue to grow larger in size, typically expanding until a predefined maximum size has been reached. Because of the hyperlink's 705 more prominent display on the user interface of web page 700, when the user opens up the web page, the user quickly sees the option that he or she chooses most often. This decreases the amount of search time required to find the hyperlink 710, which is used most frequently within the user interface environment of the web page 700.

This decrease in search time increases user productivity by getting the user to the hyperlinks that it desires quicker than if it was not more prominently displayed. This decrease in search time offsets any increase in search time required by the user to find those user interface elements that are not used most frequently and therefore displayed with less prominence.

METHOD FOR CREATING A USER INTERFACE ELEMENT BASED ON HISTORICAL USAGE (MYBARS)

Fig. 9 is a flow illustrating the steps for creating a user interface element based on historical usage in an exemplary embodiment of the present invention. This method refers to creating a new user interface element, rather than hiding or showing an existing user interface element.

Beginning at step 905, an application executed on a computer system invokes a user interface to be displayed on a monitor. The user interface contains user interface elements such as menus, toolbars and hyperlinks. In this embodiment, at least one of the user interface elements, when selected, will display a dialog box. A dialog box is a user interface element that requires the user to input various parameter values associated with the selected user interface element. The dialog box may contain check boxes, buttons, and also fields that the user can enter values associated with the parameters within the dialog box.

Proceeding to step 910, the selection of a first user interface element is received. This first user interface element is one such element that invokes a dialog box as described above. In this embodiment, the dialog box is presented to the user so that the user may input the parameter values. However, it will be recognized by one skilled in the art that other methods of accepting parameter values are widely known and are considered within the scope of the present invention. For example, an application may be used to select the first user interface element as well as to input parameter values to be used with the command associated with the first user interface element.

Proceeding to step 915, the parameter values related to the first user interface element are received. As stated above, this typically is performed through the use of a dialog box.

In step 920, a second user interface element is created which contains all the parameter values that were received in step 915. These parameters may be stored in a database for easy recall and associated with the second user interface element. The format of the second user interface element may vary drastically depending on the implementation of the present invention. It may be desirable to include this second user interface element as a graphic depicting the parameters that have been chosen, or it may be preferable to implement a string of text as the second user interface element.

The second user interface element's display is application and user dependent and will vary depending on the implementation scheme. However, any implementation that utilizes the second user interface element to store the parameter values associated with the first user interface element is considered within the scope of the present invention.

Proceeding to step 925, the second user interface element is then associated with the first user interface element. This method increases usability of a user interface by decreasing the number of steps required to perform specific tasks related to user interface elements. In the event that a user performs a task related to a user interface element that requires multiple parameter values and those parameter values are the same, this method provides a short-cut to entering those parameter values.

The second user interface, associated with the first user interface element, is also implementation specific. It may

be desirable to include another menu and associate it with the first user interface element and, in the associated menu, place the second user interface element. However, it may be preferable to include the second user interface element as a control in a toolbar or as a hyperlink. There are a multitude of user interface element types that can be used to implement the second user interface element. In addition, there are multiple display characteristics associated with the second user interface element. In this embodiment of the present invention, how the second user interface element is displayed, or what characteristics are used to display it, are design specific techniques used to implement the invention of storing parameter values with the second user interface element. Following step 925, the process terminates at step 930.

Figs. 10a-b, collectively described as Fig. 10, are graphics depicting a cascaded menu created by the user selection of a user interface element in an exemplary embodiment of the invention. The user selects a user interface item (not shown) to display a menu 1000 that includes user interface elements. In this embodiment, the user wishes to select the "print" user interface element 1005. The "print" user interface element 1005 has associated with it several parameters in order to perform the task of printing. Examples of print parameters include a printer destination and the number of pages to print. Typically, a dialog box is used once the "print" user interface element 1005 is selected so that the user may input the associated parameter values.

After selecting the "print" user interface element 1005, a dialog box (not shown) is presented and the user is enters the desired parameter values (not shown). In this representative example, the user wishes to print a current slide and to designate the printer in the mailroom on the second floor as the destination printer. It is recognized that a multitude of parameters exist for user interface element options and that any input parameter that is capable of being stored is within the scope of the present invention.

Following the user entering the parameter values associated with printing out the current slide and selecting the printer in the mailroom on the second floor, those parameter values are stored and a second user interface element containing those parameter values is created.

Fig. 10b shows the result of the user again selecting a user interface element that displays the menu 1000. When the user goes to select the "print" user interface element 1005, this embodiment has stored the "current slide; printer in mailroom" user interface element 1020 in a cascaded menu 1015. It has also associated the second user interface element 1020 (i.e., "current slide; printer in mailroom" user interface element) the with the "print" user interface element 1005.

In one embodiment of the present invention, an icon 1010 is included with the "print" user interface element 1005 indicating the user has access to the cascaded menu 1015. The cascaded menu 1015 is displayed when the user places a cursor on top of the icon 1010. In the event the user wishes to

again select the print parameters of the "current slide; printer in mailroom", the user only needs to move the cursor over the icon 1010 which will display the cascaded menu 1015. The user then proceeds to move the cursor down the list of items until it is over the desired user interface element and selects, in this case, the "current slide; printer in mailroom" user interface element 1020. By storing all the parameter values associated with the dialog box that would typically be displayed in association with the "print" user interface element 1005, the user is saved from having to perform multiple steps and reenter information that has already been keyed in.

In this embodiment the "current slide; printer in mailroom" user interface element 1020 is presented as text in a cascaded menu. However, as stated, the user interface element 1020 could be presented using any display characteristic such as a graphic, using various colors or character sizes. This embodiment supports the presentation of the second user interface element in any form, given that it is a representation of stored values entered by the user, or application, thereby preventing the user from having to reenter steps that have already been entered.

In addition, displaying the second user interface item in a menu, as shown in Fig. 10b of 1015, may also be based on historical usage of the user interface items contained in the cascaded menu. Therefore, it is considered that the second user interface may be created and then inserted in a menu using the methods described in Figs. 2-4.

In summary, the present invention is directed towards adapting user interface elements based on historical usage. In one embodiment of the present invention, a user interface element is displayed in a menu. The selection of the user interface element is then received. The selection is stored in a historical usage file that maintains information on the frequency with which the user interface is selected.

Frequency groups can be defined, each with a range of values. A user interface element is associated with the specific frequency group by matching the selection frequency value of the user interface element with the range in the frequency group. All user interface elements assigned to the same frequency group are assigned the same character size.

The character size of the selected user interface element is determined based the size allocated to the frequency group of which the selected user interface element belongs. The selected user interface element is then modified to incorporate the new character size. The modified user interface is then displayed using the modified character size.

The present invention has been described in relation to particular embodiments which are intended in all respects to be illustrative rather than restrictive. Alternative embodiments will become apparent to those skilled in the art to which the present invention pertains without departing from its spirit and scope. Accordingly, the scope of the present invention is defined by the appended claims rather than the foregoing description.

Claims

What is claimed is:

1. In a computer system running a program module, a method for modifying a user interface element for a user interface of the program module in response to usage information, comprising the steps of:

receiving a selection of the user interface element having a display characteristic;

storing the selection of the user interface element in a historical usage file for maintaining usage information regarding the user interface element;

modifying the display characteristic of the user interface element based on the usage information contained in the historical usage file; and

displaying the user interface element using the modified display characteristic.

2. The method of Claim 1, wherein the step of modifying the display characteristics of the user interface element based on information contained in the historical usage file comprises the steps of:

calculating a selection frequency of the user interface element; and

modifying the display characteristic of the user interface element based on the calculated selection frequency.

3. The method of Claim 2, wherein the step of calculating the selection frequency comprises the steps of:

determining an average selection frequency value of multiple elements of the user interface, wherein the user interface element is one of the multiple user interface elements;

defining frequency groups; and

assigning each of the multiple user interface elements to one of the frequency groups.

4. The method of Claim 1, wherein the step modifying the display characteristics of the user interface element based on information contained in the historical usage file comprises the steps of:

calculating a most recently used selection value for the user interface element; and

modifying the display characteristic of the user interface element based on the most recently used selection value.

5. The method of Claim 1 further comprising the step of storing the modified display characteristic, wherein the

stored modified display characteristic is accessible for multiple sessions of the program module.

6. The method of Claim 1, wherein the usage information of the historical usage file compares information defining selection of the user interface element by multiple users.

7. The method of Claim 1, wherein the user interface element is a hyperlink contained in a web page.

8. The method of Claim 1, wherein the display characteristic comprises a font type

9. The method of Claim 1, wherein the display characteristic comprises a font style.

10. The method of Claim 1, wherein the display characteristic comprises a character size.

11. The method of Claim 1, wherein the display characteristic comprises a graphic.

12. A computer implemented method for creating a second user interface element based on usage information for a first user interface element, comprising the steps of:

receiving a selection of the first user interface element;

receiving parameter values associated with the first user interface element, wherein the parameter values are used by a command associated with the first user interface element;

creating a second user interface containing the parameter values associated with the first user interface element; and

associating the second user interface element with the first user interface element.

13. The computer implemented method of Claim 12, further comprising the step of displaying the second user interface element when the first user interface element is selected.

14. The computer implemented method of Claim 12, further comprising the step of modifying a display characteristic of the first user interface element to provide an indication that the second user interface element is associated with the first user interface element.

15. The computer implemented method of Claim 12, wherein the first user interface element is a menu item and the second user interface element is a cascaded menu.

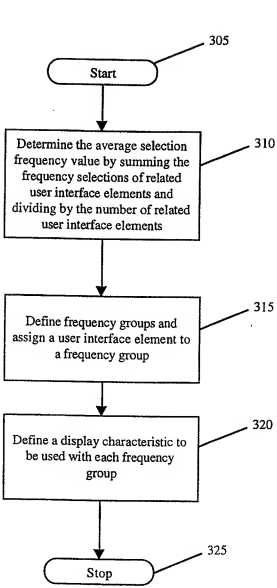
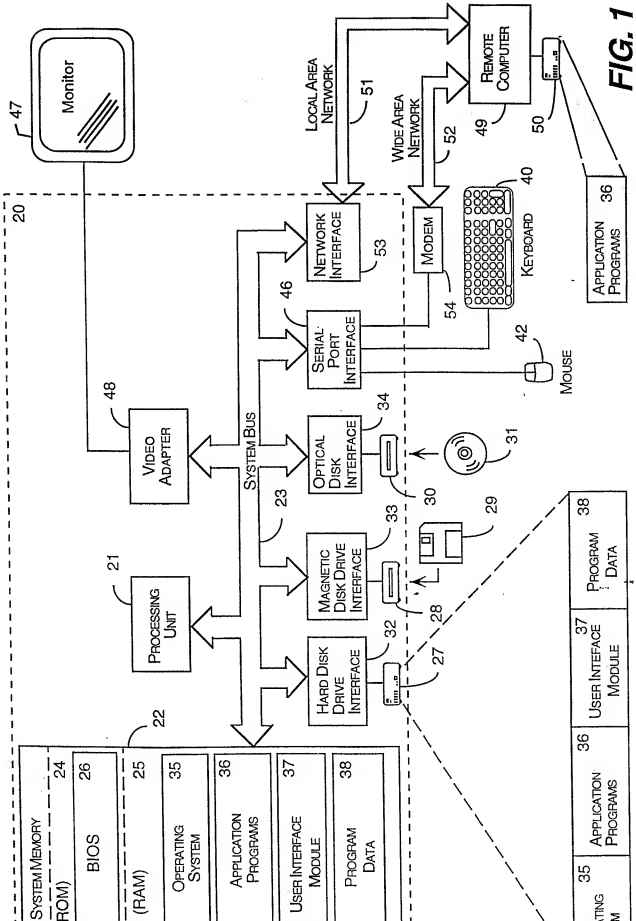

300
305
Start
Determine the average selection frequency value by summing the frequency selections of related user interface elements and dividing by the number of related user interface elements
310
Define frequency groups and assign a user interface element to a frequency group
315
Define a display characteristic to be used with each frequency group
320
Stop
325

Fig. 3


20
47
Monitor
Local Area Network
51
Wide Area Network
52
Remote Computer
49
50
Application Programs
36
Keyboard
40
Mouse
42
Modem
54
Network Interface
53
Serial Port Interface
46
Optical Disk Interface
34
Magnetic Disk Drive Interface
33
Hard Disk Drive Interface
32
Video Adapter
48
System Bus
23
Processing Unit
21
System Memory
22
ROM
24
BIOS
26
RAM
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Operating System
35
Application Programs
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User Interface Module
37
Program Data
38
27
28
29
30
31

FIG. 1

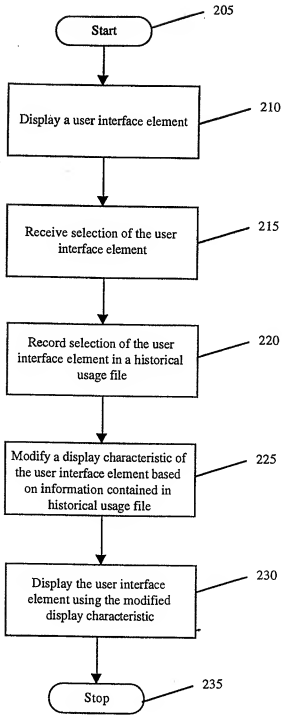
Start
205
200
Display a user interface element
210
Receive selection of the user interface element
215
Record selection of the user interface element in a historical usage file
220
Modify a display characteristic of the user interface element based on information contained in historical usage file
225
Display the user interface element using the modified display characteristic
230
Stop
235

Fig. 2

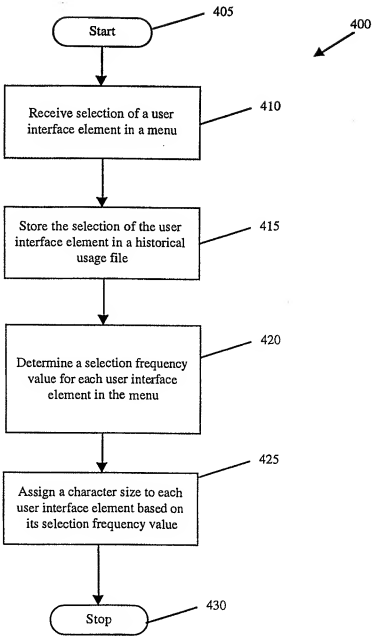
Start
405
400
Receive selection of a user interface element in a menu
410
Store the selection of the user interface element in a historical usage file
415
Determine a selection frequency value for each user interface element in the menu
420
Assign a character size to each user interface element based on its selection frequency value
425
Stop
430

Fig. 4

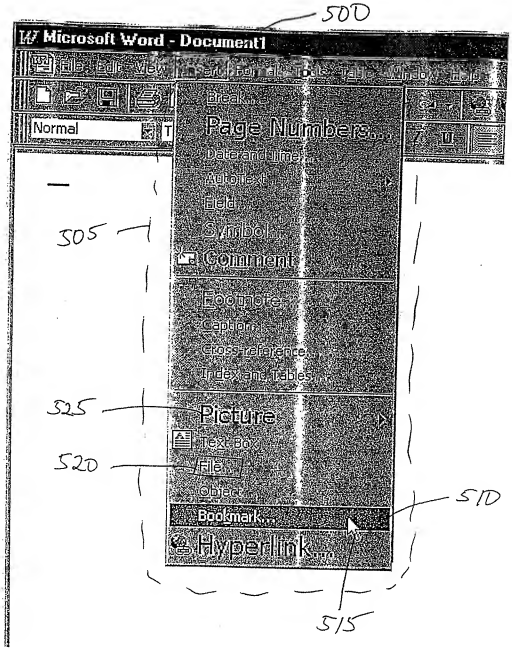
500
Microsoft Word - Document1
Normal
Page Numbers...
Date and Time...
AutoText
Field...
Symbol...
Comment
Footnote...
Caption...
Cross-reference...
Index and Tables...
Picture
Text Box
File...
Object...
Bookmark...
Hyperlink...
505
525
520
510
515

Fig. 5

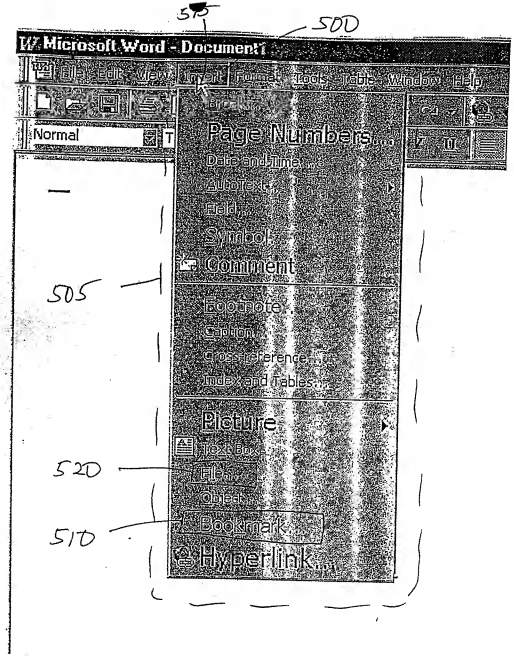
515
500
Microsoft Word - Document1
Edit View Insert Format Tools Table Window Help
Normal
Page Numbers...
Date and Time...
AutoText
Field...
Symbol...
Comment...
505
Footnote...
Caption...
Cross-reference...
Index and Tables...
Picture
Text Box
File...
Object...
520
Bookmark...
510
Hyperlink...

Fig. 6.

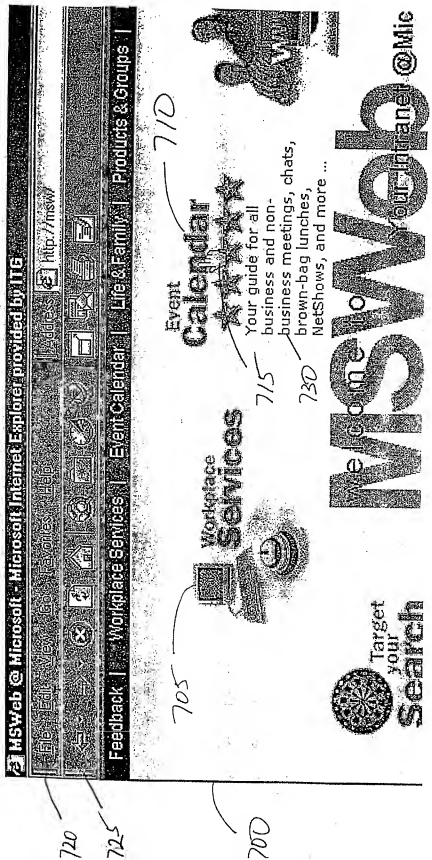
MSWeb @ Microsoft - Microsoft Internet Explorer provided by ITG
File Edit View Go Favorites Help
Address http://msweb/
Feedback | Workplace Services | Event Calendar | Life & Family | Products & Groups |
Workplace Services
Event Calendar
Your guide for all business and non-business meetings, chats, brown-bag lunches, NetShows, and more ...
Welcome to MSWeb
Your Intranet @Mic
Target your search
720
725
700
705
710
715
730

Fig 7

MSWeb @ Microsoft - Microsoft Internet Explorer provided by ITG
File Edit View Go Favorites Help
Address http://msw/
Feedback
Workplace Services
Event Calendar
Life & Family
Products & Groups
Workplace Services
Event Calendar
Target your Search
Welcome to MSWeb
your intranet @Mic
705
710
700

Fig. 8

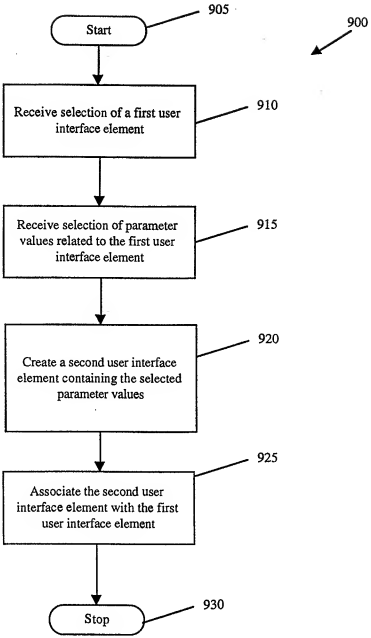
900
905
Start
910
Receive selection of a first user interface element
915
Receive selection of parameter values related to the first user interface element
920
Create a second user interface element containing the selected parameter values
925
Associate the second user interface element with the first user interface element
930
Stop

Fig. 9

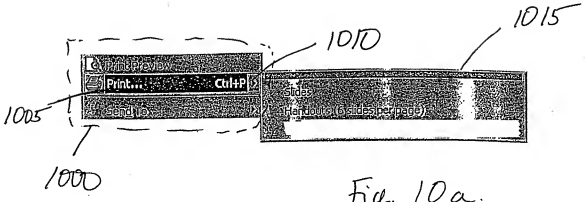

Fig. 10a.

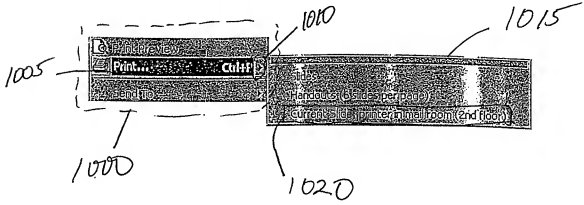

Fig. 10b

INTERNATIONAL SEARCH REPORT

Interr onal Application No
PCT/US 99/12524

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 G06F9/44

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 465 358 A (KIEL HARVEY G ET AL) 7 November 1995 (1995-11-07)	1-6,8-15
A	the whole document	7
X	EP 0 269 364 A (AMERICAN TELEPHONE & TELEGRAPH) 1 June 1988 (1988-06-01)	1-6,8-15
A	the whole document	7
X	US 5 726 688 A (MCCOLLUM TAB A ET AL) 10 March 1998 (1998-03-10)	1-6,8-15
A	the whole document	7

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
12 October 1999	19/10/1999

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Fonderson, A

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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US 5726688 A	10-03-1998	NONE	

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(30) Priority Data: 09/098,725 — 17 June 1998 (17.06.98) — US

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(74) Agents: PETTY, W., Scott et al.; Jones & Askew, LLP, 2400 Monarch Tower, 3424 Peachtree Road, N.E., Atlanta, GA 30326 (US).

(81) Designated States: JP, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published
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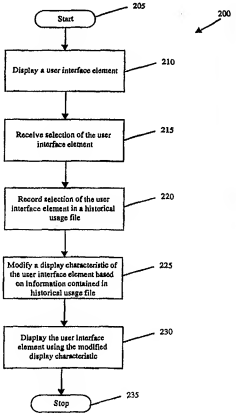
10 February 2000 (10.02.00)

(54) Title: METHOD FOR ADAPTING USER INTERFACE ELEMENTS BASED ON HISTORICAL USAGE

(57) Abstract

Adapting user interface elements based on historical usage. A user interface element is displayed in a menu. In response to receiving an indication of the selection of the user interface element, the selection is stored in a historical usage file that maintains usage information associated with the selected user interface element. Usage information includes, but is not limited to, frequency, most recently used and recency information. The display characteristic of the user interface element can be modified based on the usage information stored in the historical usage file for the selected user interface element. The display characteristics include, but are not limited to, character size, font type, style, graphic. The selected user interface element is then displayed using the modified display characteristic.



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AMENDED CLAIMS

[received by the International Bureau on 17 December 1999 (17.12.99);
original claims 1-15 replaced by new claims 1-13 (4 pages)]

1. In a computer system running a program module comprising a user interface environment, a method for modifying a user interface element for a user interface of the program module in response to usage information, comprising the steps of:

receiving a selection of the user interface element having a display characteristic;

storing the selection of the user interface element in a historical usage file for maintaining usage information regarding the user interface element;

modifying the display characteristic of the user interface element based on the usage information contained in the historical usage file;

displaying the user interface element using the modified display characteristic; and

modifying the user interface environment, such that positioning a cursor proximate to the user interface element creates an attractive force between the user interface element and the cursor, wherein the strength of the attraction is based on the usage information contained in the historical usage file.

2. The method of Claim 1, wherein the step of modifying the display characteristics of the user interface element based on information contained in the historical usage file comprises the steps of:

calculating a selection frequency of the user interface element; and

modifying the display characteristic of the user interface element based on the calculated selection frequency.

3. The method of Claim 1, wherein the step of modifying the user interface environment based on information contained in the historical usage file comprises:

calculating a selection frequency of the user interface element; and

modifying the strength of attractive force between the user interface element and the cursor based on the calculated selection frequency.

4. The method of Claim 2, wherein the step of calculating the selection frequency comprises the steps of:

determining an average selection frequency value of multiple elements of the user interface, wherein the user interface element is one of the multiple user interface elements;

defining frequency groups; and

assigning each of the multiple user interface elements to one of the frequency groups.

5. The method of Claim 1, wherein the step modifying the display characteristics of the user interface element based on information contained in the historical usage file comprises the steps of:

calculating a most recently used selection value for the user interface element; and

modifying the display characteristic of the user interface element based on the most recently used selection value.

6. The method of Claim 1, wherein the step of modifying the user interface environment based on information contained in the historical usage file comprises:

calculating a most recently used selection value for the user interface element; and

modifying the strength of the attractive force between the user interface element and the cursor based on he most recently used selection value.

7. The method of Claim 1 further comprising the step of storing the modified display characteristic, wherein the stored modified display characteristic is accessible for multiple session of the program module.

8. The method of Claim 1, wherein the usage information of the historical usage file compares information defining selection of the user interface element by multiple users.

9. The method of Claim 1, wherein the user interface element is a hyperlink contained in a web page.

10. The method of Claim 1, wherein the display characteristic comprises a font type.

11. The method of Claim 1, wherein the display characteristic comprises a font style.

12. The method of Claim 1, wherein the display characteristic comprises a character size.

13. The method of Claim 1, wherein the display characteristic comprises a graphic.